Vulnerability Metrics

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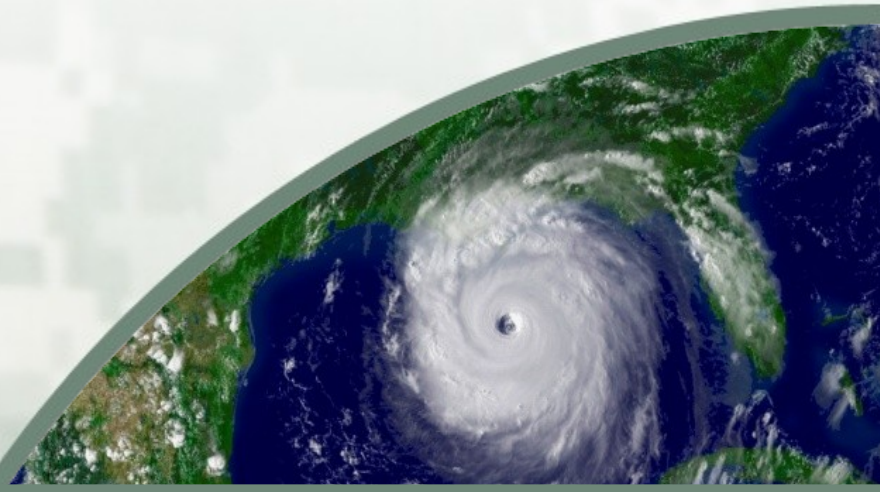

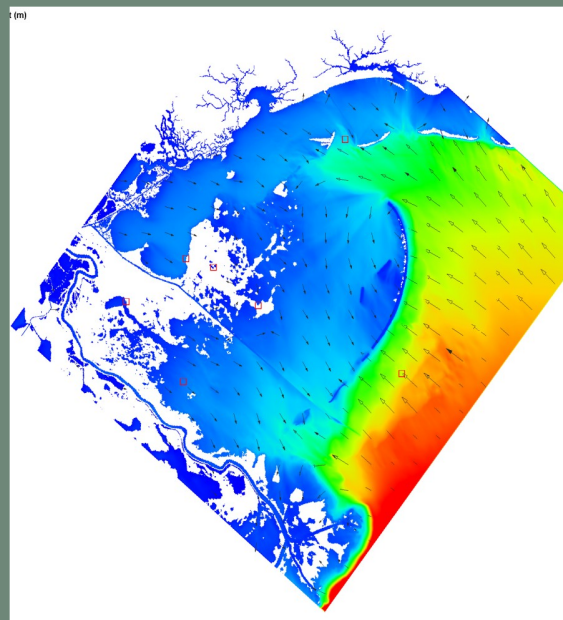

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Scope of Task

- Define vulnerability concepts and assessment
- Develop metrics relevant to evaluating vulnerability of Nature-Based Infrastructure (NBI) systems.
- Describe how NBI contributes to reducing vulnerability.

Approach

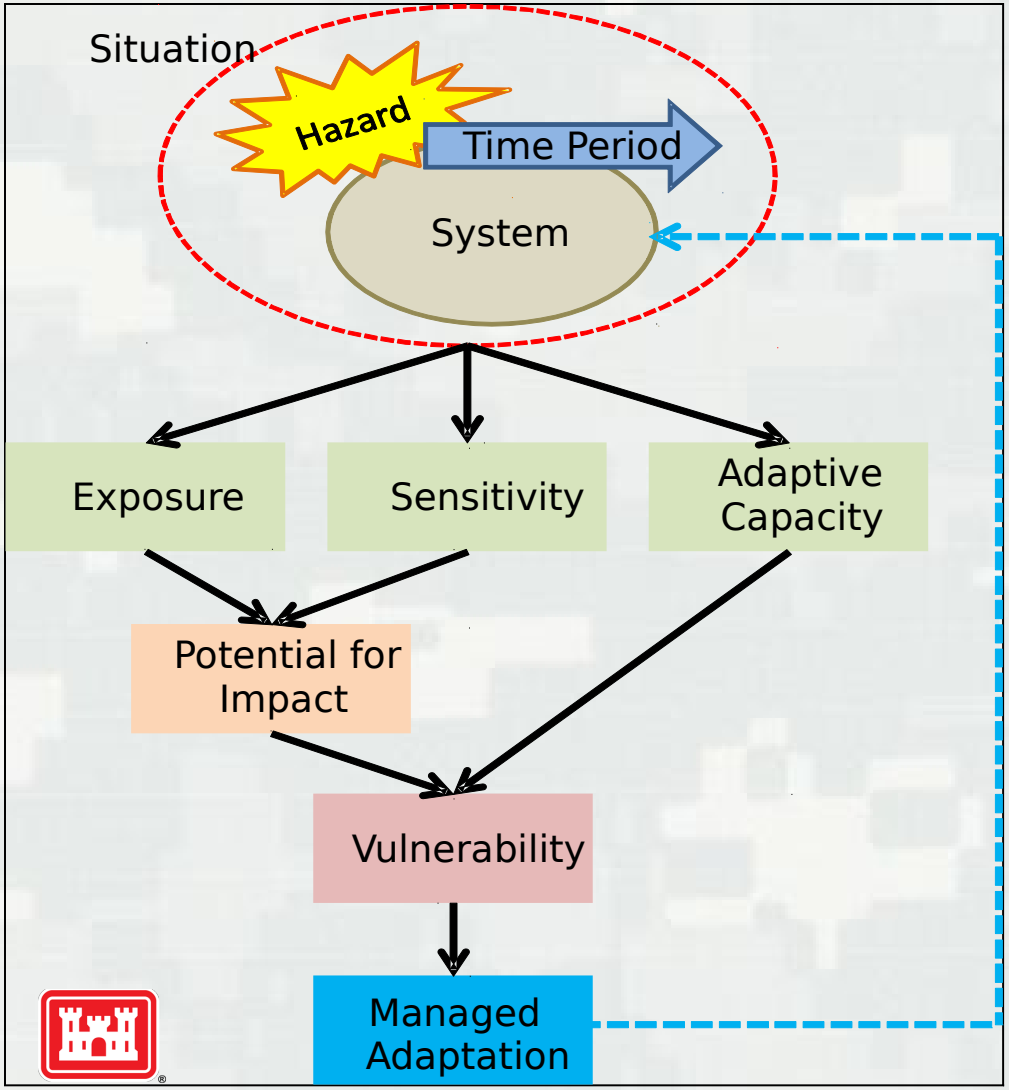
- Vulnerability metrics are a function of:
  - Policy and decision making objectives of vulnerability assessment
  - Spatial scale
  - Data availability
  - Range of hazards to be considered
  - Range of systems to assess
  - Specific characteristics of the systems to be assessed.

Approach

- Therefore, no “one size fits all” set of metrics can reasonably be developed outside the actual vulnerability assessment activity.

- Focus is therefore on:
  - ► Clearly defining vulnerability
  - ► A conceptual approach for developing metrics.

Vulnerability



Dimensions of vulnerability factors:

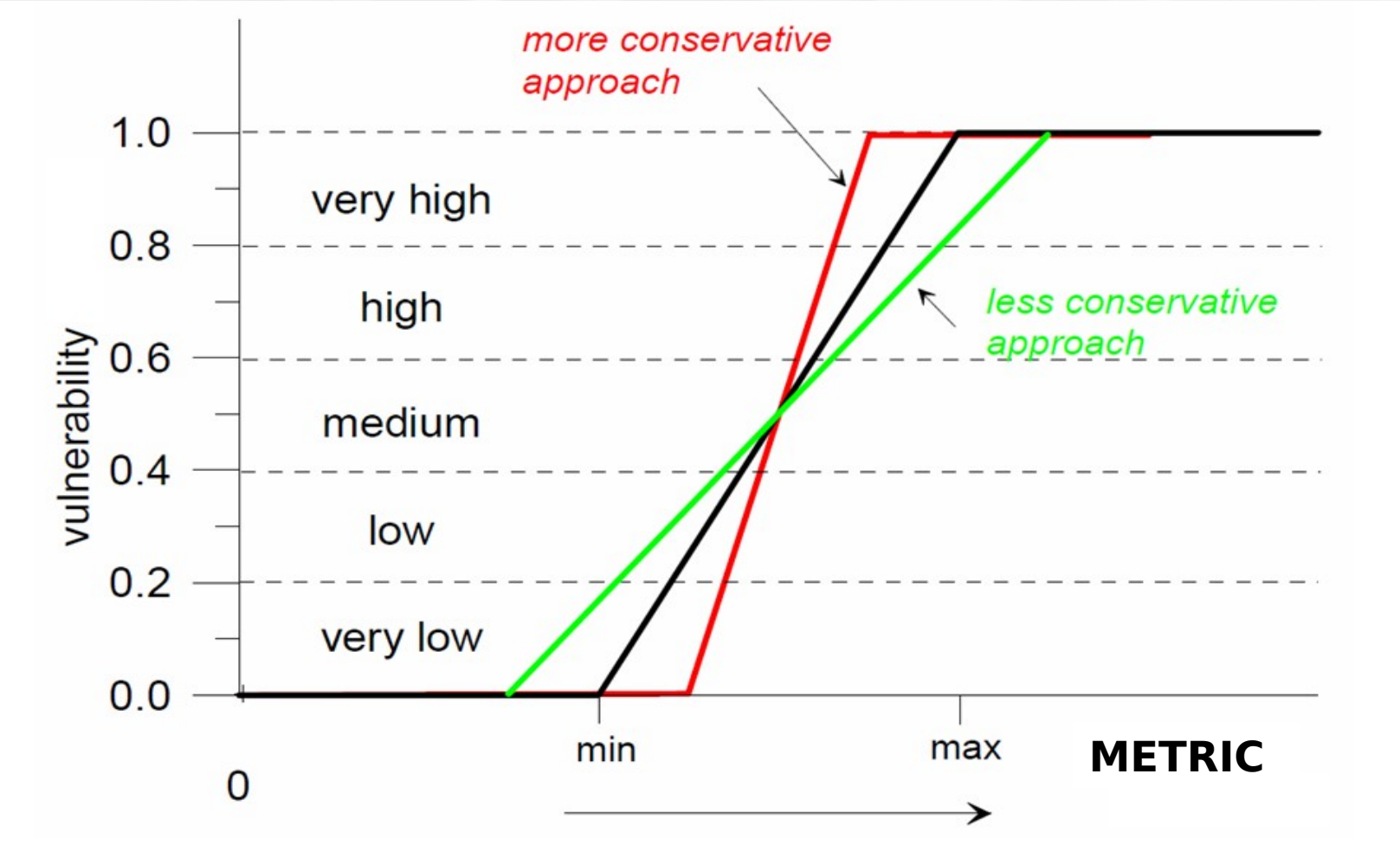
- Internal – properties of the vulnerable system or community itself
- External – factors outside the vulnerable system
- Socioeconomic – relate to economic resources, distribution of power, social institutions, cultural practices, etc.
- Biophysical – properties investigated by the physical sciences

Metrics must consider EXPOSURE, SENSITIVITY, and ADAPTIVE CAPACITY of a system.

Process

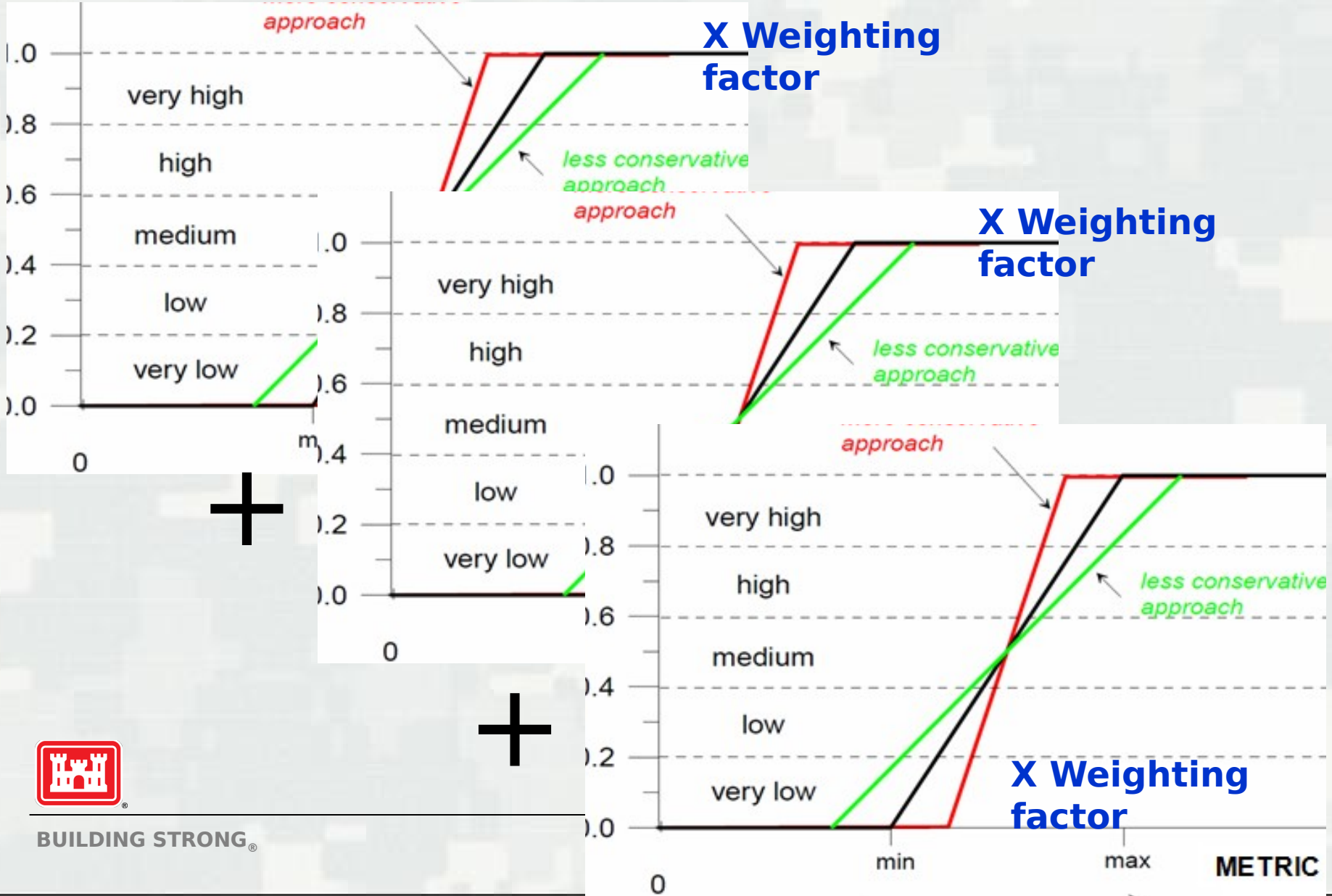
1. Identify purpose and policy/decision making objectives for assessing vulnerability.
2. Create a matrix of internal and external socioeconomic and biophysical factors to describe the vulnerability profile of a given situation.
3. Define system components and valued functions.
4. Link the vulnerability factors and their characteristics to valued functions of the system, explicitly considering the exposure, sensitivity, and adaptive capacity of the system to the hazard.
5. Establish metrics that can be used to measure the identified suite of vulnerability factors.
   - As few as possible.
   - As simple as possible.
   - Appropriate for the temporal and spatial scale of the assessment.
   - Subject to data availability.
   - Must consider the schedule and budget for conducting the assessment.

Vulnerability Assessment



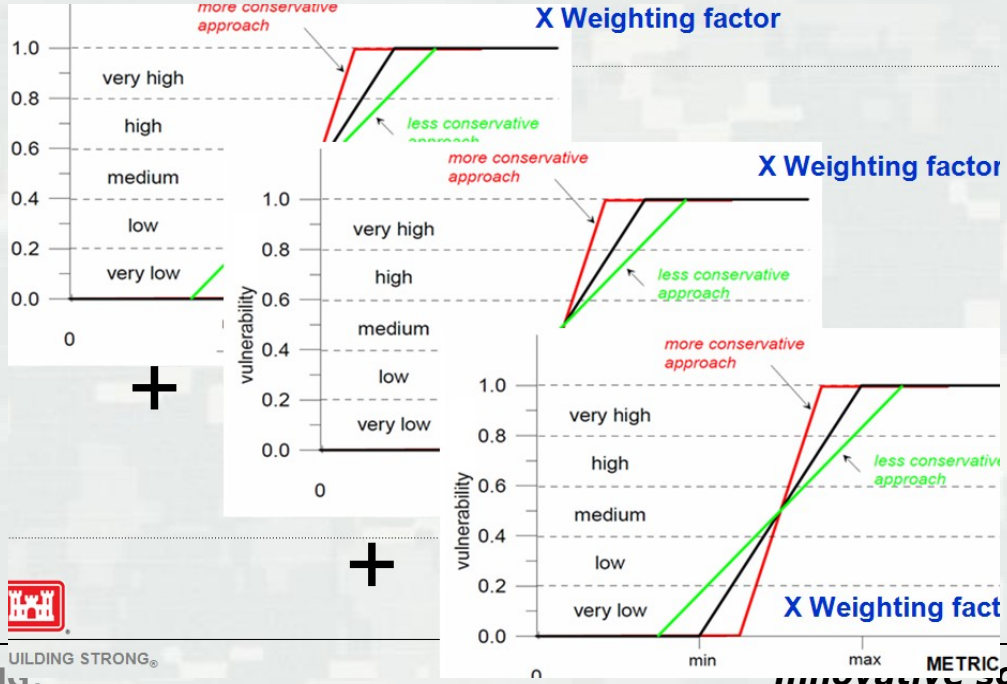
Vulnerability = f(factor measure x value assignment)

Vulnerability Assessment



Vulnerability Assessment

- "Valuing" and weighting metrics is a subjective process and therefore should be:
  - Based on a structured decision making process
  - Transparent
  - Well documented



Summary

- Vulnerability is a function of the hazard to which a system is exposed, the sensitivity of the system to the hazard, and the system's adaptive capacity. Vulnerability assessment must consider all three.
- Biophysical as well as socioeconomic factors must be considered.
- Vulnerability assessment metrics, values, and weights will vary depending on purpose, scale, data availability, schedule and budget.
- Valuing and weighting metrics must be transparent and well documented.